Red knots

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Published in:
Wadden monitoring in the spotlight

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Wadden Sea Long-Term Ecosystem Research (WaLTER)
Waddenacademie KNAW
Common Wadden Sea Secretariat (CWSS)

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Cross-bordering maps on ecology and socio-economy of Denmark, Germany and The Netherlands

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Introduction

The Wadden Sea is a unique natural intertidal ecosystem of global importance, stretching from Den Helder in The Netherlands, past the rivers and estuaries in Germany to Esbjerg in Denmark. The Wadden Sea region not only harbours a suite of distinctive plants and animals, but is also home to humans, from tourists to people living and working in the area. Its Outstanding Universal Value (OUV) was acknowledged by UNESCO, resulting in the inscription of the Dutch-German Wadden Sea on the World Heritage List in 2009. Extension with the Danish part is anticipated for 2014. The World Heritage status underlines that the entire Wadden Sea is a single ecological entity which must be managed in a harmonised way, protecting its completeness and intactness. The inscription on the World Heritage List also offers new opportunities for regional sustainable development whilst safeguarding its OUV for the benefits of present and future generations.

Long-term monitoring efforts are essential to evaluate the effectiveness of management strategies to achieve these goals. Information on the status and trends of well-chosen ecological, socio-economic and cultural parameters of the Wadden Sea region enables the identification of the progress made as the result of these actions compared to natural changes. The Trilateral Monitoring and Assessment Programme (TMAP) and other long-term monitoring programmes such as national meteorological observations and demographic surveys, provide us with this opportunity.

Such programmes revealed, for example, that winters are getting milder, that during storm surges water levels may reach up to almost five meters above mean sea level, that the sheltered basins in the southern Wadden Sea are the hotspots for mussel beds and that the trend in the number of oystercatchers is very different from that of curlews. At the same time, monitoring shows that the change in numbers of inhabitants in Wadden Sea municipalities bordering the Wadden Sea greatly varies between regions, and that labour demand in the Wadden Sea area is lagging behind compared to the rest of Denmark, Germany and The Netherlands.

This booklet visualizes a selection of recent monitoring results of the entire trilateral Wadden Sea to illustrate that continued, harmonised and effective trilateral monitoring and assessment programmes, based on sound scientific evidence, are necessary to expand our knowledge on the on-going and ever-changing interactions between ecological and socio-economic drivers within this region. Present and future information and insights from monitoring are not only essential for the protection of natural values and livelihoods of the Wadden Sea, but also provide lessons of wider scientific importance for wetlands of international value and for coastal management.

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“Small shorebirds demonstrate that the Wadden Sea is one large entity”

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Since the distribution of shorebirds searching for their prey is highly dynamic in time and space, monitoring of bird movements over vast areas has so far been a major challenge[1,2]. Satellite tracking appears to be the way forward, but this approach was so far only feasible for relatively large birds which could easily carry the additional weight of the tags. Innovative lightweight tags[3,4] are now yielding the first maps on the movements of relatively small shorebirds. On 3 October 2013, ten tag-carrying red knots were released on Texel. In their search for prey (in particular the small bivalve *Macoma balthica*) and safe foraging areas, most birds started to move throughout the international Wadden Sea region whilst one individual flew to the Wash in England. Interestingly, the young birds moved furthest away from the release point, possibly because they still had to monitor the distribution of their food sources. Adult shorebirds, such as red knots, may perhaps rely on a mental picture of good foraging areas which they build up during the first phase of their lives[1].

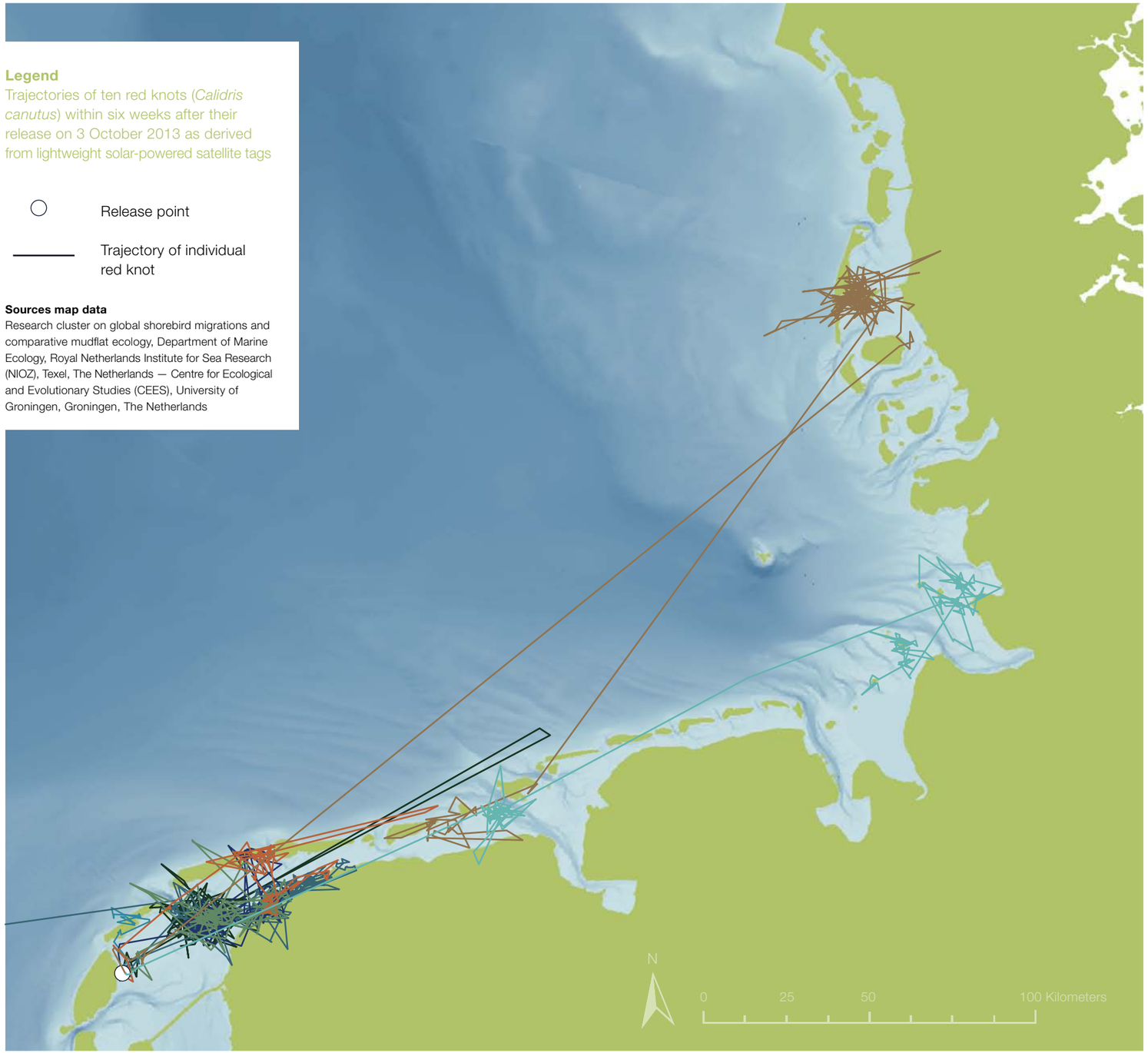
1 TOP-grant “Shorebirds in space” awarded by the Netherlands Organisation for Scientific Research (to T. Piersma, University of Groningen & NIOZ Royal Netherlands Institute for Sea Research, The Netherlands; in association with T.L. Tibbitts, Alaska Science Center, US Geological Survey, Anchorage, USA).
2 “Metawad” awarded by the Waddenfonds (grant WF209925; see www.metawad.nl).
3 Ultra-light (5 gram) solar-powered satellite tags developed by Microwave (Maryland, USA) and NIOZ (Texel, NL) with a predicted lifespan of 4-5 years which is comparable to that of the red knots.
4 Chan Y-C (in preparation) Ranging and migration behaviour of red knots in the East-Asian-Australasian Flyway. PhD Thesis, University of Groningen, Groningen, The Netherlands.

Legend
Trajectories of ten red knots (*Calidris canutus*) within six weeks after their release on 3 October 2013 as derived from lightweight solar-powered satellite tags

Release point

Trajectory of individual red knot

Sources map data
Research cluster on global shorebird migrations and comparative mudflat ecology, Department of Marine Ecology, Royal Netherlands Institute for Sea Research (NIOZ), Texel, The Netherlands — Centre for Ecological and Evolutionary Studies (CEES), University of Groningen, Groningen, The Netherlands



Acknowledgements

None of the maps could have been compiled without the long-term monitoring efforts of numerous scientists, agency staff, other professionals and volunteers. Since some of the series go back for more than one hundred years, making a complete list of all involved in gathering this wealth of information is an impossible task. We can only hope that we did everybody justice by citing the organisations and research groups of source data with the maps. Furthermore, we wish for those responsible for monitoring at present, that they find time and funding to be able to continue this vast and important work in the future. In the process of making the booklet, we were very grateful to many colleagues throughout the international Wadden Sea region for the fast response to our requests for data and for help with interpretation of the maps. In particular, we would like to thank Martin Baptist, Janette Bessembinder, Else van den Besselaar, Sophie Brasseur, John Cappelen, Michiel Daams, Bruno Ens, Eelke Folmer, Alma de Groot, Sascha Klöpper, Kees Koffijberg, Albert Oost, Theunis Piersma, Hanno Seebens, Frans Sijtsma, Raymond Sluiter and Bent Vraae Jørgensen for their interactions with the members of the editing team.